1.024 Photochemical smog modeling for ozone air quality management in Bangkok Metropolitan Region.

Early Career Scientist

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Abstract:

Surface ozone pollution remains an issue in the Bangkok Metropolitan Region (BMR), Thailand. High emissions of precursors emissions coupled with favorable meteorological conditions create ozone pollution episodes throughout the year, especially in the dry season. The annual average concentration of ozone in BMR is observed with an increasing trend. To understand its formation in order to formulate mitigation strategies for improving the ozone air quality in the BMR, a collaborative research aiming at applications of photochemical smog models was conducted jointly by the Asian Institute of Technology (AIT) and PTT Public Company Limited. A high resolution emission inventory (EI) data was prepared for major anthropogenic sources of on-road transport, industrial, power plant, livestock, farm machine, navigation, locomotive, and residential combustion. Volatile organic compounds (VOCs) emissions from fuel station and biogenic VOC were also included in the EI. Gridded hourly emissions were prepared in 2x2 km^2 grid resolution with the necessary VOC speciation for modeling input.
CAMx/MM5 modeling system was selected to simulate ozone in March and August 2010 which respectively represent high and low ozone pollution month in the BMR domain. Model performance evaluation was conducted for both modeled meteorology and ozone levels using the existing observation which showed acceptable model performances in terms of statistical criteria. The maximum monthly average in the domain of modeled ozone concentrations in March and August were about 41 ppb and 38 ppb while the maximum modeled hourly ozone concentrations were 159 ppb (March) and 158 ppb (August). Ozone formation regime in BMR was more sensitive to VOC than to NOx emission reduction hence to meet the hourly standard of 100 ppb, either a VOC reduction of >50% or NOx reduction of >90% would be required. Various emission scenarios can be analyzed using the evaluated modeling system to propose appropriate emission control strategies.